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AGRICULTURAL NEWS LETTER

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This publication gives information on new developments of interest to agriculture on laboratory and field investigations of the du Pont Company and its subsidiary companies.

In addition to reporting results of the investigations of the Company and its subsidiaries, published reports and direct contributions of investigators of agricultural experiment stations and other institutions are given dealing with the Company's products and other subjects of agricultural interest.



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ETHYL MERCURY PHOSPHATE FOR TREATING COTTON SEED
FOUND EFFECTIVE AND ECONOMICAL BY INVESTIGATORS

EDITOR'S NOTE:- The importance of seed treatment for the prevention of plant diseases is being widely recognized by cotton planters.

By Gilbert F. Miles, Chief of Research,
Bayer-Semesan Company, Wilmington, Del.

During the annual meeting of the Association of Southern Agricultural Workers held in New Orleans in February, 1939 much attention was devoted to the subject of cotton seed disinfection. To summarize the reports and discussions on the subject, the Cotton Seedling Disease Committee of the association issued the following statement:

"The experience of the several members of the seedling disease committee as presented in the discussions at New Orleans leads the committee to the conclusion that New Improved 'Ceresan' (5% ethyl mercury phosphate) is equally as effective as, and probably superior to, 'Ceresan' (2% ethyl mercury chloride) as a seed treatment material for cotton when the two materials are used at rates which give equivalent amounts of mercury per seed. This conclusion is supported by results obtained by the members of the committee in tests conducted independently of each other over a period of 3 to 5 years as well as the results of the regional cotton seed treatment tests of 1938. It is believed that the rate of application of New Improved 'Ceresan' as at present constituted should not be less than 1 ounce, nor more than 2 ounces, but preferably 1-1/2 ounces per bushel of fuzzy seed for average planting conditions. Further study is being made of this point. Planting seed that has been de-linted should also be dusted with New Improved 'Ceresan' if the seed is likely to experience other than very favorable conditions for germination after planting.

"Storage tests show no indication of injury which may have resulted from either 'Ceresan' or New Improved 'Ceresan' while the treated seed was in storage. However, tentative to further information, the committee advises that seed to be treated should not have a moisture content in excess of 12% and that it be stored in a place where it will not take up moisture in excess of that amount."

Independent Laboratory and Field Tests

The following comments and suggestions to the prospective user of New Improved "Ceresan" as a cotton seed treatment are based on the results of laboratory studies and field tests conducted by the Research Department of the Bayer-Semesan Company, Inc. and are not to be understood as coming from the Cotton

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Seedling Disease Committee. It may be said, however, that the information supplied in the statement by the committee is in general accord with that developed independently by the investigators of this company.

In addition to its superior effectiveness in reducing losses from seedling diseases, New Improved "Ceresan" (5% ethyl mercury phosphate) will reduce substantially the cost of seed treatment, because the required dosage is only one-half of that recommended for 2% "Ceresan" (2% ethyl mercury chloride) sold at approximately the same price per pound.

Against these important advantages of greater effectiveness and economy must be set certain definite, although not serious, disadvantages, which should be understood by those following the new recommendations.

First, the superior fungicidal properties of New Improved "Ceresan" dust are accompanied by an increase in the phytocidal action of the disinfectant, which is approximately proportionate to the mercury content of the two products. Thus, cotton seeds will tolerate roughly two and one-half times as much 2% "Ceresan" (2% ethyl mercury chloride) as they will New Improved "Ceresan" (5% ethyl mercury phosphate). While the tolerated dosages for both disinfectants will vary considerably with the condition of the seed and other factors, it is roughly correct to say that seed injury usually becomes serious when the rate of application is advanced beyond 7-1/2 ounces of 2% "Ceresan" or 3 ounces of New Improved "Ceresan" per bushel of fuzzy seed. Therefore, an error of, say, 2 ounces of disinfectant per bushel of seed in calibrating the powder feeding device on a seed treater would probably do no harm in the case of 2% "Ceresan" but might result in serious injury to the seed by New Improved "Ceresan".

Precautions in Connection with Treatment

The probability of an error of serious proportion occurring when seed is being treated one bushel at a time in a rotary drum is negligible, but large scale operators using the continuous feed type of treater such as the Calkins or the Gustafson should give careful attention to the calibration of the powder feeding device to be sure that the correct amount of powder is being applied. Each morning a known weight of disinfectant should be given to the seed treating crew and a record should be kept of the number of bushels or sacks of seed treated. It will then be easy to check several times a day the amount of dust used against the number of bushels of seed treated and to make certain that approximately the correct dosage is being applied.

In the continuous feed type of treater the powder feed mechanism continues to deliver powder into the treating chamber as long as the machine is running, regardless of whether the seed hopper is full or empty. If the seed hopper is allowed to become empty without shutting off the power, the dust accumulating in the treating chamber will be picked up in an excessive amount by the first portions of the next lot of seed treated. The remedy is, of course, simple; the machine should be stopped as soon as the seed hopper is emptied, even though it is to be empty for only a few seconds.

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The smaller recommended dosage for New Improved "Ceresan" (1-1/2 to 2 ounces per bushel of fuzzy seed) will necessitate somewhat greater care to secure reasonably uniform distribution of the dust over the seed than was required for 2% "Ceresan" with the 3-ounce dosage. One of the outstanding features of the ethyl mercury compounds responsible for their effectiveness as disinfectants for cotton, as well as other seeds, is their volatile or vapor forming property. Laboratory tests have shown that cotton seed exposed for several days to the vapors of New Improved "Ceresan" is disinfected just as thoroughly as if the powder itself had been applied to the seed. While the volatile nature of the compound does facilitate distribution of the active ingredient in vapor form throughout the mass of seed and its lint covering and thus increases the thoroughness of the disinfecting action, nevertheless there is a limit to the assistance that can be expected from this source in correcting deficiencies in the distribution of the dust by the seed treater. Those who take a little extra time to adjust and operate their seed treaters so as to obtain maximum distribution of the dust on the seed will be rewarded with better stands at chopping time.

Moisture Content of Seed Important

The treatment of cotton seed with 2% "Ceresan" was formerly a spring time operation, the seed often being loaded for shipment as soon as the sack had been sewn. More and more, however, the large handlers of cotton seed prefer to begin the seed treating operation as soon as possible after ginning. This means that in many years the seed at the time of treatment has a higher moisture content than was contemplated during the early experimental work on cotton seed disinfection.

Preliminary investigations indicate that unless the moisture content of the seed is higher than 16% at the time of treating, seed injury by dosages of 1-1/2 or 2 ounces of New Improved "Ceresan" per bushel is not apt to occur. With excessive rates of application, however, seed with a high moisture content is more easily injured than is well cured seed. Pending further studies of the relationship between moisture content of seed and injury by the disinfectant, cotton growers and seedsmen should by all means follow the suggestion of the Cotton Seedling Disease Committee and postpone the treatment of seed until the moisture content has been reduced to about 12 percent or less.

Still another question which is coming to the foreground relates to the proposed use of bags made of cotton instead of burlap for the storage and shipment of treated seed. Some of the cotton bags under consideration are rather tightly woven by contrast with the more loosely woven burlap bags now commonly used. Burlap bags permit the escape of the vapors emanating from the disinfectant on the seed. Tightly woven bags may tend to prevent the escape of the vapors and so build up in the bag a concentration of vapors which may be injurious to the seed. Seedsmen should go slowly in adopting a bag made of any air-tight or nearly air-tight fabric until it has been established that bags of that sort are safe to use.

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Safety Measures Necessary

In using New Improved "Ceresan" operators should remember at all time that the larger amount of active ingredient, as compared with 2% "Ceresan", increases the toxicity of the product to human beings. Ethyl mercury phosphate, in addition to being poisonous internally, is irritating to the skin and in severe cases may cause blistering and burning.

For large scale operations adequate ventilating equipment should be provided to keep flying powder and lint out of the air. Workmen should be provided with non-porous aprons and gloves if necessary, to prevent the dust accumulating on the skin. They should be required, not merely instructed, to keep the dust off the skin and to remove immediately with soap and water any of the powder which is accidentally spilled on the skin.

The highly beneficial effects on stands and yields produced by cotton seed disinfection certainly justify the small amount of care required of grower or seedsman to do a first class job of seed treatment.

"Ceresan" is a trade-mark registered in the
U. S. Patent Office by Bayer-Semesan Company,
Wilmington, Delaware.

THE BROADENING FIELD OF APPLIED ENTOMOLOGY OFFERS
OPPORTUNITIES FOR INCREASED SERVICE TO THE PUBLIC

EDITOR'S NOTE:- This is an abstract of an article by Dr. M. D. Leonard, entomologist, du Pont Company, published in Journal of Economic Entomology 32 (2): 229-234, 1939.

When the United States was primarily an agricultural country applied entomology and plant pathology quite naturally developed around agricultural activities. These were originally and until rather recently almost entirely financed by Federal and State agencies.

As time went on, private businesses grew up around the manufacture and sale of agricultural insecticides and such enterprises quite naturally began to employ their own technically trained men for research and for sales promotion. These were the first industrial or non-official professional entomologists.

With the increase of business and industry, city populations became larger and the prevention and reduction of losses by injurious insects and fungi to stored and processed products, lumber and buildings, as well as to gardens and to park and large shade tree plantings, became increasingly necessary.

Pest control in the future will assume much more importance in the public mind and economy "in a world which is changing with ever-increasing rapidity in the complexity of its social, industrial and economic aspects."

In an attempt to arouse entomologists and plant pathologists to a greater consciousness of their responsibilities as well as their opportunities for increased service to the public, the writer points out that more attention should be paid to the desirability of such trained workers further developing fields of commercial activities. To illustrate the possibilities of such procedure, the following are listed and discussed:

The agricultural insecticide industry which is to date estimated to be at least a \$100,000,000 business annually based on retail sales costs in the United States.

The control of insects affecting stored grains and other stored products which cause great losses to large businesses handling such products.

The more efficient and economical prevention and the reduction of losses to both the size and quality of crops due to insect and disease attack, which is extremely important in the rapidly expanding canning and frozen-food industries.

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More effective and reliable exterminating services for city and suburban houses and buildings, including rat control and termite treatments, in an already nation-wide but as yet relatively little-developed industry, which is estimated to collect upwards of \$50,000,000 annually for its services.

Commercial Field Offers Opportunities

"Plant doctors" and Consulting Entomologists. These are still very few in number, although one authority asserts there is room for at least 5000 of the former in towns and cities of say 20,000 population or larger in the United States.

Commercial airplane dusting and spraying of trees and of ground-crops. This has been until recently but very little developed except in the case of cotton dusting.

Fumigation of buildings, stored products and such other articles as clothing and furniture is also suggested as a promising field for greater activity.

Household insecticides in their manufacture, laboratory control and uses, present specialized technical problems which only trained workers have been able to solve.

It is suggested that advanced courses be organized and developed in the larger training centers for entomologists and plant pathologists in an attempt to give serious students of pest control a more adequate conception of their future broader fields of commercial and industrial possibilities. They should also be presented with pertinent facts and information, as well as with special viewpoints, calculated to better enable themselves and their profession to take advantage of the increasing opportunities for service.

It is pointed out that probably not more than 10 per cent of the professional entomologists (and this undoubtedly applies to plant pathologists as well) are employed at present by business and industry. Chemists, physicists and psychologists, for example however, have been successful to a much greater degree in directly connecting themselves with such enterprises to the unquestioned advantage of both parties and of the public as a whole.

**DIPHENYLAMINE AS WOUND PROTECTOR AGAINST THE SCREWWORM
RECOMMENDED BY UNITED STATES DEPARTMENT OF AGRICULTURE**

EDITOR'S NOTE:- The excerpts below are from circulars issued by the U. S. Bureau of Entomology and Plant Quarantine. Diphenylamine of the required grade and fineness is made by the du Pont Company.

Circular E-480, June, 1939:

Since discovery by Cushing and Patton that *Cochliomyia americana* C. and P. is the primary screwworm fly, considerable study has been made on the biology and control of this important livestock pest. Laake, Cushing, and Parish have published on the biology of the screwworm. The present paper deals with studies on improved methods on that phase of control which has to do with wound protection.

Since most materials in general use as wound dressings depend on their repellent properties to prevent screwworm infestation, the discovery that phenothiazine, while it would not prevent oviposition or the hatching of eggs, would prevent, in the majority of cases, the young larvae from establishing themselves in the wound, paved the way for a new approach to the screwworm problem. During the past two years over 600 materials in powder or granular form were tested against screwworms in the hope of finding compounds with more effective larvicidal and wound-protective properties. All the compounds were tested in the laboratory on artificial screwworm-breeding media as a means of selecting materials that would kill young screwworm larvae. The more toxic compounds were tested on animals infested with screwworms.

Of the many chemicals tested, several appear to be effective wound protectors. One of these promising materials, diphenylamine, has been studied extensively in the laboratory and on artificial and natural screwworm cases. Although much remains to be determined regarding methods, time intervals of application, the degree of fineness for best performance, etc., the results seem worthy of presentation at this time, since there is a definite need for a more effective treatment than is now available to ranchmen.

Tested on Sheep, Goats, and Cattle

Circular E-481

A crystalline chemical substance known as diphenylamine has been found to be very effective for protecting wounds of livestock from becoming infested with screwworms and for treating wounds infested with these maggots.

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The value of diphenylamine for the control of screwworms was discovered after extensive tests had been made with it and a large number of other chemical compounds on several hundred sheep, goats, and cattle under ranch conditions in southwestern Texas.

Diphenylamine is not a strong fly repellent and does not entirely prevent flies from laying their eggs on wounds, but it kills the tiny screwworms hatching from these eggs before they can injure the tissues. It has been found to be greatly superior to pine tar oil, bone oil, and many other fly-repellent substances commonly used for the prevention of screwworm infestations. Not only does this material serve to protect wounds against infestation, but it will kill the young worms up to 3 days old that may be present in a wound. It cannot be depended on, however, to kill screwworms that are more than 3 days old.

Note:- Since only a few excerpts from Circulars E-480 and E-481 are given here, it is recommended that readers obtain complete copies.

FUMIGATION OF MUSHROOM HOUSES WITH HOT FORMALDEHYDE GAS
FROM OUTSIDE VAPORIZER FOR CONTROL OF UNDESIRABLE FUNGI

EDITOR'S NOTE:- The method described here was developed by the Jacob Mushroom Division of the Grocery Products Manufacturing Corporation, West Chester, Pa.

An effective and economical method for fumigating mushroom houses with formaldehyde gas has been devised by a large commercial grower in Chester county, Pennsylvania.

By use of this means of fumigation, together with other sanitary measures, control of "unfriendly fungi" -- such as truffles and Mycogone -- is obtained at low cost.

The growing house is prepared for a new crop by a thorough cleaning and washing with water or a solution of 4 per cent commercial formaldehyde solution in water. Following this, the house is carefully sealed and then fumigated with formaldehyde gas.

The gas is obtained from formaldehyde solution which is vaporized in a small boiler set up outside the house and connected with it by a 2-in. iron pipe.

Equal quantities of water and commercial formaldehyde (37 per cent) solution are used. The boiler is heated either by means of a small oil burner or by a wood fire.

Following fumigation, the house is aired, and the compost -- already pasteurized by high temperature fermentation -- is laid and the spawn are planted. If any spots of truffles appear in the beds, they are immediately isolated by trenching and drenched with 37 per cent formaldehyde solution. This gives effective control. The treatment does not injure growing mushrooms in the rest of the bed, it is claimed. Similarly, if Mycogone appear anywhere in the early stages of the crop, dilute (4 per cent) formaldehyde solution is sprinkled on the infested areas. This kills Mycogone, and the mushrooms which come up later are healthy.

In the spawn plant inoculating rooms are fumigated with formaldehyde and all crates dipped in a 4 per cent solution before they are used for culture bottles.

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Advantages Over Other Fumigation Methods

The general method of fumigation has been to vaporize formaldehyde solution in pots inside the houses by partial oxidation with potassium permanganate. This procedure not only involves the expense of permanganate, but also consumes some of the available formaldehyde in the reaction, and often not all of the remaining formaldehyde is vaporized.

The hot formaldehyde gas method has several important advantages. These include the generation of the gas outside of the growing house, the saving of the cost of another chemical, and more complete vaporization and effective application of the formaldehyde.

Recommended Dosages of Formaldehyde

Using the method described, the dosage is one quart ($2\frac{1}{4}$ lbs.) of commercial (37 per cent) formaldehyde solution to approximately 1,000 cu. ft. of space. This dosage, using the potassium permanganate method, is also recommended by the U. S. Department of Agriculture Bulletin No. 457, while the Pennsylvania State College School of Agriculture and Experiment Station Bulletin recommends three pounds per 1,000 cu. ft. of space. Exposure is for 24 hours. It is to be noted that careful attention is given to sanitation at all points of the operation.

Note:- An illustrated folder on fumigation, both cyanide and formaldehyde, is available on request to the R. & H. Chemical Department of the du Pont Company, Wilmington, Del.

NEW BOOK ON BLASTING DITCHES WITH EXPLOSIVES
STATES THE PRINCIPLES AND PRACTICES INVOLVED

EDITOR'S NOTE:- This 62-page book serves not only as a practical guide for users of explosives, but also lends itself to use as a text-book for classroom and field instruction. Copies will be sent without charge on request.

Under the title of "Blasting Ditches With Explosives", there has been prepared a revised and amplified edition of a similar book issued by the Agricultural Extension Division of E. I. du Pont de Nemours & Company.

The purpose of this book is to give its readers a working knowledge of using dynamite for blasting ditches. It describes the methods of making ditches and their maintenance with explosives particularly adapted to such requirements. This information applies to drainage as required for farm land, highway construction, and for other purposes where drainage is necessary and can be accomplished in an economical and efficient manner. The methods described and the quantity of explosives needed for blasting various sizes of ditches are based upon actual performances extending over wide areas and accurate reports of accomplishments.

Illustrative of the practical character of the text is the following: "A blasted ditch is a series of overlapping craters, each made by the explosion of an individual charge of dynamite, but so arranged that all the charges explode at the same time. One charge loaded at the proper depth, and shot in soil, makes a hole like the shape of an inverted cone. The sides of this cone are usually at a 45-degree angle with the surface -- or a 1 to 1 slope, as described by engineers."

A diagram shows the effect of exploding a single charge and the effect of exploding a series of charges in a line.

When to Use Dynamite

The book does not claim that all ditches should be blasted. It does, however, point out distinct advantages of blasting under stated conditions. This discussion follows: "Dynamite has a very definite place in the economical excavation of ditches. The explosive is a concentrated, easily transported form of energy. Therefore, it can be moved over rough ground and through marshy country without a great deal of trouble. Where a short job is to be done -- even

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though it be a dry ditch -- dynamite can be used often to advantage. The wetter the material to be blasted, the lower the dynamiting costs will be found. Where obstructions are encountered, such as stumps, boulders or sunken logs, they are blasted with the ditch in one operation.

"If time is a factor in the work, no other method, or equipment, is comparable with using dynamite. The extent of the ditch blasting performance is limited only by the man-power required to make the holes and place the cartridges. When the explosion takes place, the material is thrown high in the air, and it is spread for a considerable distance on both sides of the ditch." Obviously, the spreading of the blasted material over a considerable area operates to save the time and money which is usually necessary in disposing of excavated soil.

The Completeness of the Book

Besides detailed instructions for practically every type of ditch blasting and clean-out operation, the book describes blasting tools, blasting accessories, kinds of dynamite, loading and firing methods, safety rules and practices, etc.

More than forty photographs are used for illustrations, together with many line drawings, graphs and tables.
